CLAIMS

What is claimed is:

1. An apparatus to communicate between a first circuit board and a second circuit board, the apparatus comprising:

a light transmitter attached to a first circuit board; and

a corresponding light receiver attached to a second circuit board, the corresponding light receiver positioned to receive data signals through the air transmitted by the light transmitter when the first and second circuit boards are coupled with a backplane.

2. The apparatus of Claim 1 wherein the light transmitter is a laser diode.

3. The apparatus of Claim 2 wherein the laser diode is a Vertical Cavity Surface Emitting Laser (VCSEL).

4. The apparatus of Claim 1 wherein the corresponding light receiver is tuned to the frequency of the light transmitter.

5. The apparatus of Claim 1 wherein the light transmitter is selected from the group consisting of a laser transmitter, a radio transmitter, a digital transmitter, an infrared transmitter, and an ultraviolet transmitter.

6. The apparatus of Claim 1, further comprising;

a first fiber optic cable is operatively coupled with the light transmitter on the first circuit board to relay data signals to the light transmitter; and

a second fiber optic cable operatively coupled with the corresponding light receiver on the second circuit board to relay data signals received by the corresponding light receiver.

7. The apparatus of Claim 1 wherein the light transmitter and the corresponding light receiver are housed within a card or system chassis to eliminate copper backplane interconnects and connectors within a stacked board system.

8. An apparatus to communicate between a first circuit board and a second circuit board, the apparatus comprising:

a first light transmitter affixed to the first circuit board;

a first corresponding light receiver attached to the second circuit board, the first corresponding light receiver positioned to receive data signals through the air transmitted by the first light transmitter when the first and second circuit boards are coupled with a backplane;

a second light transmitter affixed to the second circuit board; and

a second corresponding light receiver affixed to the first circuit board, the second corresponding light receiver positioned to receive data signals transmitted by the second light transmitter when the first and second circuit boards are coupled with a backplane.

9. The apparatus of Claim 8 wherein the first corresponding light receiver is tuned to the frequency of the first light transmitter, and wherein the second corresponding light receiver is tuned to the frequency of the second light transmitter.

10. The apparatus of Claim 9 wherein the first light transmitter transmits a first frequency signal, and wherein the second light transmitter transmits a second frequency signal.

11. The apparatus of Claim 8 wherein at least the first light transmitter is selected from the group consisting of a laser transmitter, a radio transmitter, a digital transmitter, an infrared transmitter, and an ultraviolet transmitter.

12. The apparatus of Claim 8 wherein a fiber optic cable is coupled with at least one of the light transmitters or light receivers to relay data signals.

13. The apparatus of Claim 8 wherein at least the first light transmitter and the first corresponding light receiver are housed within a card or system chassis to eliminate copper backplane interconnects and connectors within a stacked board system.

14. The apparatus of Claim 8 wherein the first light transmitter is a first laser diode and second light transmitter is a second laser diode.

15. The apparatus of Claim 14 wherein the first laser diode and the second laser diode are each a Vertical Cavity Surface Emitting Laser (VCSEL).

16. The apparatus of Claim 14 wherein the first laser diode transmits a first frequency color, and wherein the second laser diode transmits a second frequency color.

17. A method to communicate between a first circuit board and a second circuit board, the method comprising:

affixing a light transmitter to the first circuit board, the light transmitter to transmit a data signal at a particular frequency;

affixing a corresponding light receiver to the second circuit board;

tuning the corresponding light receiver to the particular frequency of the light transmitter;

coupling the first circuit board with a chassis;

coupling the second circuit board with the chassis, such that the second circuit board is positioned substantially parallel the first circuit board; and

positioning the light transmitter and corresponding light receiver such that the corresponding light receiver receives a data signal through the air transmitted by the light transmitter.

18. The method of Claim 17, further comprising:

coupling a fiber optic cable with the light transmitter to relay a data signal to the light transmitter; and

coupling a fiber optic cable with the corresponding light receiver to relay a data signal received by the light receiver.

19. The method of Claim 17, further comprising:

selecting the light transmitter from a group consisting of a laser transmitter, an ultraviolet transmitter, a radio transmitter, an infrared transmitter, and a digital transmitter.

20. The method of Claim 17, further comprising:

selecting the type of light receiver to correspond to the type of light transmitter selected.

21. The method of Claim 17 wherein affixing a first light transmitter to the first circuit board and affixing a corresponding light receiver to the second circuit board eliminates copper backplane interconnects and connectors within a stacked board system.

22. A method to communicate between a first circuit board and a second circuit board, comprising:

mounting a first light transmitter to the first circuit board, the first light transmitter to transmit a first data signal at a first particular frequency;

mounting a first corresponding light receiver to the second circuit board, the first corresponding light receiver being positioned to receive the first data signal transmitted by the first light transmitter when the first and second circuit boards are coupled with a backplane;

mounting a second light transmitter to the second circuit board, the second light transmitter to transmit a second data signal at a second particular frequency;

mounting a second corresponding light receiver to the first circuit board, the second corresponding light receiver being positioned to receive the data signal through the air transmitted by the second light transmitter when the first and second circuit boards are coupled with a backplane.

23. The method of Claim 22, further comprising:

tuning the first corresponding light receiver to the first particular frequency of the first light transmitter; and

tuning the second corresponding light receiver to the second particular frequency of the second light transmitter.

24. The method of Claim 22, further comprising:

selecting at least the first light transmitter from the group consisting of a laser transmitter, a radio transmitter, a digital transmitter, an ultraviolet transmitter, and an infrared transmitter.

25. The method of Claim 22, further comprising:

transmitting a first frequency color from the first light transmitter; and

transmitting a second frequency color from the second light transmitter.

26. A fault-tolerant system, comprising:

a first circuit board removably inserted within a first receptor of a backplane, the first circuit board having a first, second, and third light receivers affixed to its bottom surface;

a second circuit board removably inserted within a second receptor of the backplane, the second circuit board having a first and second light transmitters affixed to its top surface, the second circuit board having an aperture therein, and having a fourth and fifth light receivers affixed to its bottom surface; and

a third circuit board removably inserted within a third receptor of the backplane, the third circuit board having a third, fourth, and fifth light transmitters affixed to its top surface.

27. The fault-tolerant system of Claim 26, further comprising:

a first optical channel defined between the first light receiver and the first light transmitter.

28. The fault-tolerant system of Claim 26, further comprising:

a second optical channel defined between the third light receiver and the second light transmitter.

29. The fault-tolerant system of Claim 26, further comprising:

a third optical channel defined between the second light receiver and the fourth light transmitter, wherein a data signal carried by the third optical channel passes through the aperture in the second circuit board.

30. The fault-tolerant system of Claim 26, further comprising:

a fourth optical channel defined between the fourth light receiver and the third light transmitter.

31. The fault-tolerant system of Claim 26, further comprising:

a fifth optical channel defined between the fifth light receiver and the fifth light transmitter.

32. The fault-tolerant system of Claim 26 wherein a detected change in transmission intensity of a faulted data signal automatically initiates an orderly shutdown and rerouting of the faulted data signal.

33. The fault-tolerant system of Claim 32 wherein the change in transmission intensity results from an insertion or removal of a circuit board from the stack of circuit boards.

34. The fault-tolerant system of Claim 26 wherein removal of the second circuit board from the stack of circuit boards during operation of an optical channel automatically provides an alternate optical channel.

35. The fault-tolerant system of Claim 26 wherein no physical connection between circuit boards is needed to transmit and receive a data signal through the air between two or more boards.

36. The fault-tolerant system of Claim 26, wherein a spare backplane receptor contains a backup circuit board that can be operated in a shadow mode until ordered to carry data traffic rerouted from a faulted optical channel.

37. A method, comprising:

providing a plurality of circuit boards, each board having at least a light transmitter affixed to its top surface and at least a light receiver affixed to its bottom surface, at least one board having an aperture therein;

removably inserting the plurality of circuit boards into a corresponding plurality of receptors in a backplane, wherein the circuit board having an aperture therein is positioned between a first circuit board and a second circuit board, such that a data signal transmitted through the air from a light transmitter on either the first or second circuit board can pass through the aperture.

38. The method of Claim 37, further comprising:

establishing at least one optical channel between the plurality of boards, the optical channel being defined by a light transmitter on one board transmitting a data signal through the air to a corresponding light receiver on another board.

39. The method of Claim 37, further comprising:

arranging the plurality of circuit boards into a first group and a second group, wherein a placement of circuit boards in the first group forms a pattern, and wherein a placement of circuit boards in the second group forms a mirror image of the pattern.

40. The method of Claim 37, further comprising:

designating a redundant circuit board to operate in a shadow mode until a change in transmission intensity is detected in an optical channel.

41. The method of Claim 40, further comprising:

detecting a change in transmission intensity in the optical channel that occurs when a circuit board is inserted or removed;

automatically rerouting a data signal from the faulted optical channel through the redundant circuit board; and

automatically managing an orderly shutdown of the faulted optical channel.

42. The method of Claim 37, further comprising:

transmitting a first frequency color from the first light transmitter; and

transmitting a second frequency color from the second light transmitter.